

Course Syllabus

Mathematics, Grade 8

Jefferson County Schools Curriculum, Final
Jefferson County Schools

The Terra Nova Complete Battery for Mathematics is "designed to help students show what they know and can do. Many questions call for critical thinking, reasoning, and problem solving. Questions allow students to use different strategies and to take individual paths to a solution. Real-world topics engage students' interest, and the extensive use of graphics reduces the need for explanatory text and provides a supportive context. Themes group items into meaningful configurations, and items are generally sequenced to promote initial success so that students will continue with confidence to more challenging questions.

The [Terra Nova] tests taps broad mathematical power, yet retains the specifics from the traditional curriculum. The first section of the test includes computation, computation in context, and estimation items, and is administered without calculators. The second section covers a broad range of core skills and may be administered with calculators. Some questions require the use of rulers, which are supplied with the testing materials."

The Tennessee Mathematics Curriculum Standards provide standards, performance indicators, and accomplishments for students in mathematics.

The Terra Nova Complete Battery assesses students in eighth grade (Level 18).

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Algebraic Concepts

The Algebraic Concepts Unit includes Competencies/Objectives which focus on algebraic equations and operations. Students explore the symbolic nature of algebraic concepts by identifying and extending patterns in algebra, by following algebraic procedures, and by proving theorems with properties.

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- The learner will be able to (IMPORTANT) develop an understanding for intercept and slope.
- The learner will be able to (ESSENTIAL) develop multi-step equations that illustrate a relationship or real world scenario.
- The learner will be able to (ESSENTIAL) evaluate a first-degree algebraic expressions when given the values of two or more variables.
- The learner will be able to (ESSENTIAL) identify and generate equivalent forms for simple algebraic expressions.
- The learner will be able to (ESSENTIAL) relate symbolic expressions and the graphs of lines.
- The learner will be able to (ESSENTIAL) apply exponents.
- The learner will be able to (ESSENTIAL) solve real world problems by applying formulas.
- The learner will be able to (IMPORTANT) identify a function as being either linear or nonlinear.
- The learner will be able to (IMPORTANT) apply tables, graphs, or equations to compare and contrast the properties of functions.
- The learner will be able to (ESSENTIAL) comprehend the concept of a function.
- The learner will be able to (IMPORTANT) understand patterns, relations, and functions.
- The learner will be able to (IMPORTANT) compare relationships that are linear to nonlinear relationships.
- The learner will be able to (ESSENTIAL) interpret graphs which represent rates of change.
- The learner will be able to (ESSENTIAL) understand the concepts of inequalities.
- The learner will be able to (IMPORTANT) recognize the graph of the solution to a one-variable inequality on a number line.

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- The learner will be able to (IMPORTANT) comprehend and apply inverse relationships of addition and subtraction, multiplication and division, and squares and square roots in order to simplify computations and obtain problem solutions.
- The learner will be able to (IMPORTANT) apply a variety of procedures to obtain solutions to real world problems that involve multiple step linear equations (e.g., manipulatives, technology, pencil and paper).
- The learner will be able to (IMPORTANT) identify the graph of a line given its equation.
- The learner will be able to (IMPORTANT) illustrate linear relationships using various forms.
- The learner will be able to (IMPORTANT) illustrate and analyze mathematical situations and structures by applying algebraic symbols.
- The learner will be able to (ESSENTIAL) match the correct graph to a linear equation.
- The learner will be able to (ESSENTIAL) obtain solutions to linear equations.
- The learner will be able to (ESSENTIAL) obtain solutions to one- and two-step linear equations that involve integers.
- The learner will be able to (ESSENTIAL) obtain solutions to single-step linear inequalities.
- The learner will be able to (ESSENTIAL) conceptually understand order of operations.
- The learner will be able to (IMPORTANT) represent, study, and generalize many different patterns with tables, graphs, words, and symbolic rules, when possible.
- The learner will be able to (ESSENTIAL) generalize a pattern by stating the rule applying symbolic notation.
- The learner will be able to (IMPORTANT) comprehend special values of patterns, relationships, and functions (e.g., x- and y- intercepts, slope, maximum and minimum values).
- The learner will be able to (ESSENTIAL) solve problems by applying algebraic properties.
- The learner will be able to (IMPORTANT) obtain solutions to real world problems by applying various representations (e.g., graphs, tables, equations).
- The learner will be able to (IMPORTANT) comprehend and represent quantitative relationships using mathematical models.
- The learner will be able to (IMPORTANT) develop comprehension for rate of change in real world scenarios.
- The learner will be able to (IMPORTANT) relate and compare various forms of representations for a relationship.
- The learner will be able to (IMPORTANT) develop a comprehension for arithmetic and geometric sequences.
- The learner will be able to (ESSENTIAL) comprehend the concept of sets.
- The learner will be able to (ESSENTIAL) apply symbolic algebra to illustrate scenarios and to obtain solutions to real world problems.

Data Analysis and Probability

- The learner will be able to (ESSENTIAL) make interpretations of data displays.
- The learner will be able to (ESSENTIAL) determine the mean of a given set of real-world data.
- The learner will be able to (ESSENTIAL) determine the median of a given set of real-world data (even number of data).
- The learner will be able to (IMPORTANT) formulate conjectures to create new questions for future research.
- The learner will be able to (IMPORTANT) find, use, and interpret measures of center and spread (e.g., mean, interquartile range).

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- The learner will be able to (IMPORTANT) formulate questions that can be addressed with data and collect, organize, and display relevant data to answer data.
- The learner will be able to (ESSENTIAL) draw conclusions from data.
- The learner will be able to (ESSENTIAL) form inferences from gathered data.
- The learner will be able to (IMPORTANT) select, create and use appropriate graphical representations of real-world data (e.g., histogram, box plots, scatter plots).
- The learner will be able to (ESSENTIAL) choose a suitable display to illustrate a data set.
- The learner will be able to (ESSENTIAL) describe the relationship that exists between a data set and its graphical representation (e.g. histograms, stem-and-leaf plots, box plots, scatterplots) (Learning Accomplishment includes bar graphs, line graphs, and circle graphs).
- The learner will be able to (ESSENTIAL) interpret suitable graphical displays of data (i.e., histograms, box plots, scatterplots).
- The learner will be able to (ESSENTIAL) identify misleading representations of data.
- The learner will be able to (IMPORTANT) formulate questions, design studies, and collect real-world data for investigations using a variety of collection methods (e.g. random sampling, simulations).
- The learner will be able to (IMPORTANT) find the probability of both dependent and independent events.
- The learner will be able to (ESSENTIAL) read a line graph.
- The learner will be able to (IMPORTANT) develop an understanding of mutually exclusive events.
- The learner will be able to (ESSENTIAL) make conjectures and predictions based on a given set of data.
- The learner will be able to (IMPORTANT) formulate and evaluate predictions according to sample data.
- The learner will be able to (IMPORTANT) calculate the probability of compound events using various methods (e.g., multiplication, organized lists, tree diagrams, area models).
- The learner will be able to (IMPORTANT) comprehend and apply the basic concepts of probability.
- The learner will be able to (ESSENTIAL) obtain solutions to problems by applying data.
- The learner will be able to (ESSENTIAL) comprehend the concepts of sampling.
- The learner will be able to (ESSENTIAL) identify an appropriate sample to test a given hypothesis.
- The learner will be able to (IMPORTANT) understand the concept of line of best fit.
- The learner will be able to (IMPORTANT) develop an understanding for frequency, distribution, and outliers.
- The learner will be able to (IMPORTANT) choose and use suitable statistical methods to analyze data.
- The learner will be able to (ESSENTIAL) understand concepts, processes, and properties of statistics.
- The learner will be able to (ESSENTIAL) connect the symbolic representation of a probability to an experiment.

Geometry

The Geometry Unit includes Competencies/Objectives which focus on exploring geometric concepts from multiple perspectives. Students study properties and construction of figures, proofs and theorems, history of geometry, transformations, logic, and problem solving.

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- The learner will be able to (ESSENTIAL) comprehend the concept of an angle.
- The learner will be able to (ESSENTIAL) measure angles.
- The learner will be able to (ESSENTIAL) comprehend the relationships that exist among angles (i.e., complementary, supplementary, interior, exterior, vertical, corresponding).
- The learner will be able to (ESSENTIAL) obtain problem solutions by applying angle relationships (i.e., complementary, supplementary, interior, exterior, vertical, corresponding).
- The learner will be able to (IMPORTANT) relate symmetry and congruence to reflections about a line.
- The learner will be able to (ESSENTIAL) identify and define circle parts.
- The learner will be able to (ESSENTIAL) combine geometric figures in creating other geometric figures.
- The learner will be able to (IMPORTANT) determine congruence of line segments, angles, and polygons through direct comparison based upon characteristics.
- The learner will be able to (ESSENTIAL) plot points on a coordinate grid.
- The learner will be able to (ESSENTIAL) apply an understanding of the coordinate system.
- The learner will be able to (IMPORTANT) draw geometric shapes with particular properties using suitable instruments and techniques (e.g., side lengths, angle measure).
- The learner will be able to (IMPORTANT) explain, classify, and comprehend relationships among types of two- and three-dimensional figures using properties.
- The learner will be able to (ESSENTIAL) apply geometric concepts and relationships in topics outside of the mathematics classroom (i.e., art, science, everyday life).
- The learner will be able to (ESSENTIAL) apply inductive and deductive reasoning to solve problems.
- The learner will be able to (IMPORTANT) use formulas or other procedures to solve problems that involve perimeter, circumference of a circle, and the area of triangles, parallelograms, trapezoids, and circles.
- The learner will be able to (ESSENTIAL) apply the geometric properties.
- The learner will be able to (IMPORTANT) develop comprehension of the basic concept of the Pythagorean Theorem.
- The learner will be able to (IMPORTANT) use visualization, spatial reasoning, and geometric modeling to solve problems.
- The learner will be able to (ESSENTIAL) use spatial reasoning skills.
- The learner will be able to (ESSENTIAL) obtain solutions to real world problems by applying visualization and spatial reasoning.
- The learner will be able to (ESSENTIAL) communicate the relationships that exist between angles and side lengths of similar geometric shapes.
- The learner will be able to (IMPORTANT) comprehend the relationships that exist between angles and side lengths of similar shapes.
- The learner will be able to (ESSENTIAL) identify similar geometric figures.
- The learner will be able to (ESSENTIAL) classify three-dimensional figures using their properties.
- The learner will be able to (IMPORTANT) analyze characteristics and properties of two and three-dimensional solids.
- The learner will be able to (IMPORTANT) specify locations and explain spatial relationships by applying coordinate geometry and various other representational systems.

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- The learner will be able to (ESSENTIAL) obtain solutions to problems using spatial visualization.
- The learner will be able to (IMPORTANT) apply two dimensional representations of three dimensional shapes to visualize.
- The learner will be able to (ESSENTIAL) subdivide figures.
- The learner will be able to (IMPORTANT) apply transformations and use symmetry to study mathematical situations.
- The learner will be able to (IMPORTANT) describe sizes, positions, and orientations of shapes under transformations (e.g., rotations, translations, reflections, dilations).
- The learner will be able to (ESSENTIAL) find the measurement of the angle in a triangle when given the measures of the other two angles.
- The learner will be able to (ESSENTIAL) use the appropriate formula to calculate the area of a parallelogram, triangle and trapezoid.
- The learner will be able to (ESSENTIAL) determine the circumference and area of a circle using a given formula.
- The learner will be able to (ESSENTIAL) accurately convert, within a measurement system, from one unit to another.
- The learner will be able to (IMPORTANT) obtain solutions to problems that involve distance, time, and rate (i.e., $d=rt$).
- The learner will be able to (ESSENTIAL) obtain solutions to real world problems that involve distance, time, and rates (i.e., $d = rt$).
- The learner will be able to (ESSENTIAL) use various techniques to estimate length, perimeter, circumference, area, and volume.

Measurement

The Measurement Unit includes Competencies/Objectives which focus on measurement concepts, applications, and analysis. Students study length, area, circumference, perimeter, volume, weight, formulas, distance, calendar, money, tools, accuracy, units, constructions, patterns, and problem solving.

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- The learner will be able to (IMPORTANT) apply angle relationships to obtain the measure of an unknown angle (e.g., complementary, supplementary, interior, exterior, vertical, corresponding).
- The learner will be able to (ESSENTIAL) compute the area of irregular figures.
- The learner will be able to (IMPORTANT) apply appropriate techniques, tools, and formulas to determine measurement.
- The learner will be able to (IMPORTANT) apply proportional relationships and properties of similar geometric shapes to determine measurements.
- The learner will be able to (IMPORTANT) comprehend the measurable characteristics of objects and the units, systems, and processes of measurement.
- The learner will be able to (ESSENTIAL) perform calculations with money.
- The learner will be able to (ESSENTIAL) determine the perimeter of a geometric figure.
- The learner will be able to (ESSENTIAL) solve real world problems using the Pythagorean Theorem (no radicals).
- The learner will be able to (IMPORTANT) create tables and graphs to illustrate rates of change.

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- The learner will be able to (ESSENTIAL) apply ratio and proportion to obtain solutions to problems involving scale factors.
- The learner will be able to (ESSENTIAL) apply scales in maps.
- The learner will be able to (ESSENTIAL) use scale drawings.
- The learner will be able to (ESSENTIAL) construct two- and three-dimensional scale models of common objects.
- The learner will be able to (ESSENTIAL) understand temperature concepts in problem solving situations.
- The learner will be able to (IMPORTANT) choose and use methods and tools to accurately determine length, perimeter, area, volume, and angle measures to suitable levels of precision.
- The learner will be able to (ESSENTIAL) identify a suitable unit of measure for use in a particular situation.
- The learner will be able to (ESSENTIAL) choose units of suitable size and type to measure angles, perimeter, area, surface area, and volume.
- The learner will be able to (IMPORTANT) comprehend both metric and customary systems of measurement.
- The learner will be able to (IMPORTANT) understand, choose, and apply units of suitable size and type to measure angles, perimeter, area, surface area, and volume.
- The learner will be able to (IMPORTANT) compare and contrast the volumes of a variety of geometric solids.
- The learner will be able to determine the volume of prisms and cylinders using a given formula.
- The learner will be able to (ESSENTIAL) compare and order rational numbers (fractions, decimals, and percents) using appropriate symbols ($<$, $>$, $=$).
- The learner will be able to (ESSENTIAL) compare and order numbers.
- The learner will be able to (ESSENTIAL) correctly perform various computations.
- The learner will be able to (ESSENTIAL) compute efficiently and accurately with whole numbers, fractions, decimals, and percents.
- The learner will be able to (ESSENTIAL) perform computations in the context of given problems.
- The learner will be able to (IMPORTANT) develop and analyze strategies for calculating with fractions, decimals, and integers.
- The learner will be able to (IMPORTANT) choose and apply suitable strategies and tools for calculating with whole numbers, fractions, decimals, percents, and integers in problem solving scenarios (e.g., mental computation, estimation, calculators, computers, paper and pencil).
- The learner will be able to (ESSENTIAL) find the best buy by computing rates that involve cost per unit.
- The learner will be able to (ESSENTIAL) determine divisibility.
- The learner will be able to (ESSENTIAL) comprehend the concepts of equivalent forms.
- The learner will be able to (ESSENTIAL) use estimation in solving problems.
- The learner will be able to (ESSENTIAL) make estimations with money.
- The learner will be able to (IMPORTANT) solve problems, compute fluently, and make reasonable estimates.
- The learner will be able to (ESSENTIAL) identify when it is appropriate to estimate.
- The learner will be able to (ESSENTIAL) find factors.
- The learner will be able to (IMPORTANT) apply physical, pictorial, and symbolic representations of integers.

Number and Operations

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- The learner will be able to (IMPORTANT) develop the concepts of opposites, reciprocals, and integers.
- The learner will be able to (ESSENTIAL) comprehend the concept of models.
- The learner will be able to (ESSENTIAL) model problem scenarios.
- The learner will be able to (ESSENTIAL) model problem solutions.
- The learner will be able to (IMPORTANT) express a monomial written in expanded form by applying exponents.
- The learner will be able to (ESSENTIAL) find multiples.
- The learner will be able to (IMPORTANT) recognize exponential, scientific, and calculator notation to express large numbers in a real world scenario.
- The learner will be able to (ESSENTIAL) recognize the opposite and the reciprocal of a rational number.
- The learner will be able to (ESSENTIAL) approximate the location of rational numbers on a number line.
- The learner will be able to (IMPORTANT) understand numbers, ways of representing numbers, relationships among numbers, and number systems.
- The learner will be able to (IMPORTANT) use number theory concepts to solve problems (e. g., divisibility, factors, multiples, composite numbers, prime factorization, relatively prime).
- The learner will be able to (IMPORTANT) create meaning for percents greater than one hundred and less than one.
- The learner will be able to (ESSENTIAL) identify numbers.
- The learner will be able to (IMPORTANT) recognize the opposite of a rational number.
- The learner will be able to (ESSENTIAL) comprehend the concept of percent.
- The learner will be able to (IMPORTANT) solve real world, one-step problems which involve whole numbers, fractions, decimals, and percents.
- The learner will be able to (IMPORTANT) understand the operations and show how they relate to one another.
- The learner will be able to (IMPORTANT) comprehend the meaning and effects of operations on fractions, decimals, and integers.
- The learner will be able to (ESSENTIAL) comprehend number patterns.
- The learner will be able to (ESSENTIAL) use number patterns.
- The learner will be able to (IMPORTANT) recognize the place value of a given digit.
- The learner will be able to (ESSENTIAL) work flexibly with fractions, decimals, and percents in order to obtain solutions to one- and two-step problems.
- The learner will be able to (IMPORTANT) obtain solutions to real world problems requiring several steps involving whole numbers, fractions, decimals, and percents.
- The learner will be able to (IMPORTANT) apply the distributive property to simplify computations with integers, fractions, and decimals.
- The learner will be able to (IMPORTANT) use the associative and commutative properties of addition and multiplication to simplify calculations with integers, fractions, and decimals.
- The learner will be able to (ESSENTIAL) use proportional reasoning to solve story problems.
- The learner will be able to (IMPORTANT) comprehend and apply ratios and proportions to illustrate quantitative relationships.
- The learner will be able to (ESSENTIAL) comprehend the concepts of ratio and/or proportion.

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- The learner will be able to (ESSENTIAL) use ratio and proportions to represent real world situations (i.e., scale drawings, probability).
- The learner will be able to (IMPORTANT) develop and apply techniques to estimate the results of rational number calculations in real world scenarios.
- The learner will be able to (ESSENTIAL) estimate quantities containing rational numbers by applying a variety of estimation methods.
- The learner will be able to (IMPORTANT) judge the reasonableness of rational number estimates or calculations.
- The learner will be able to (ESSENTIAL) use the order of operations when calculating with rational numbers using no more than two parentheses and exponents 1 and 2.
- The learner will be able to (IMPORTANT) raise rational numbers to whole number powers.
- The learner will be able to (ESSENTIAL) read numbers.
- The learner will be able to (IMPORTANT) apply a variety of models to illustrate the relationships within the real number system (e.g., Venn diagrams, webs).
- The learner will be able to (IMPORTANT) apply suitable mathematical vocabulary and symbols to express numerical relationships in real world scenarios (e.g., $<$, $>$, $=$, $.$).
- The learner will be able to (ESSENTIAL) understand and/or apply roots and/or radicals.
- The learner will be able to (ESSENTIAL) apply scientific notation.
- The learner will be able to (ESSENTIAL) evaluate the reasonableness of a given solution.
- The learner will be able to (IMPORTANT) create, describe, and analyze methods for obtaining solutions to problems involving proportions (e.g., scaling, finding equivalent ratios).
- The learner will be able to (ESSENTIAL) find the square root of a number that is a perfect square (<169).
- The learner will be able to (IMPORTANT) understand and use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems.